CLAIMS

1. A planar electron emitter device, the planar electron emitter device comprising:

an emitter electrode;

an extractor electrode; and

a solid-state field controlled electron emitter having a Schottky metal-semiconductor junction fabricated on the emitter electrode and electrically coupled to the extractor electrode such that an electric potential placed between the emitter electrode and the extractor electrode results in field emission of electrons from an exposed surface of the Schottky metal-semiconductor junction, wherein the semiconductor layer of the Schottky metal-semiconductor junction includes an outer perimeter that is thicker in depth than at an interior portion of the semiconductor layer thereby reducing electron beam emission at the outer perimeter wherein an electric field applied between the emitter electrode and the extractor electrode draws emission electrons from the surface of the planar electron emitter towards the extractor electrode at a higher rate at the interior portion than at the outer perimeter.

2. The planar electron emitter device according to claim 1 further comprising a focusing electrode electrically coupled to the planar electron emitter.

3. The planar electron emitter device according to claim 1 wherein the planar electron emitter has a generally concave top surface.

4. The planar electron emitter device according to claim 1 wherein the planar electron emitter comprises a metal first layer and a semiconductor second layer deposited on the metal first layer.

5. The planar electron emitter device according to claim 1 further comprising a dielectric placed between the emitter electrode and the extracting electrode.

6. The planar electron emitter device according to claim 2 further comprising a second dielectric placed between the extracting electrode and the focusing electrode.

7. The planar electron emitter device according to claim 4 wherein the semiconductor second layer comprises a wide band-gap semiconductor.

8. A process for fabricating planar electron emitters comprising:

forming an emitter electrode layer;

forming an extracting electrode layer;

exposing the emitter electrode layer by removing at least a portion of the extracting electrode layer;

depositing a semiconductor material above the emitter electrode in a manner resulting in a controlled thickness gradient extending from a center location of the semiconductor material deposited to an outer perimeter of the semiconductor material deposited.

9. A process for fabricating planar electron emitters according to claim 8 also comprising the step of, prior to forming the extracting electrode layer, forming a metal layer on the emitter electrode layer wherein the depositing step places the semiconductor material on the metal layer.

10. A process for fabricating planar electron emitters according to claim 8 wherein the semiconductor material deposited above the emitter electrode forms a concave top surface.

11. A process for fabricating planar electron emitters according to claim 8 further comprising the step of, prior to the depositing step, forming a focus electrode layer above the extracting electrode layer.

12. A process for fabricating planar electron emitters according to claim 8 further comprising forming a spacer dielectric between the emitter electrode layer and the extracting electrode layer.

13. A process for fabricating planar electron emitters according to claim 11 further comprising forming a second dielectric layer between the extracting electrode layer and the focusing electrode layer.

14. A storage apparatus comprising:

a storage medium having at least one storage area, the storage area being in one of a plurality of states to represent the information stored in that storage area;

at least one planar electron emitter device to generate an electron beam current utilized to read and write the information stored in the storage areas, the planar electron emitter device comprising:

an emitter electrode;

an extractor electrode; and

a planar electron emitter, electrically coupled to the emitter electrode and the extractor electrode, that has an outer perimeter that is thicker in depth than at an interior portion of the planar electron emitter.

15. The storage apparatus according to claim 14 comprising means of addressing said electron beams to storage areas on the storage medium by a motion relative to one another.

16. The storage apparatus according to claim 14 further comprising means for addressing the electron beams to storage areas on the storage medium by beam steering.

17. The storage apparatus according to claim 14 wherein the planar field emitter further comprises a focusing electrode electrically coupled to the planar electron emitter.

18. The storage apparatus according to claim 14 wherein the planar electron emitter has a generally concave top surface.

19. The storage apparatus according to claim 14 wherein the planar electron emitter comprises a metal first layer and a semiconductor second layer deposited on the metal first layer.

20. The storage apparatus according to claim 14 further comprising a dielectric placed between the emitter electrode and the extracting electrode.

21. The storage apparatus according to claim 17 further comprising a second dielectric placed between the extracting electrode and the focusing electrode.

22. The storage apparatus according to claim 19 wherein the semiconductor second layer comprises a wide band-gap semiconductor.

23. A planar field emission electron emitter device, the field emission electron emitter device comprising:

an emitter electrode;

an extractor electrode; and

a planar electron emitter, electrically coupled to the emitter electrode and the extractor electrode to provide an electric field to draw emission electrons from the surface of the planar electron emitter wherein the planar electron emitter is configured to bias electron emission in a central region in preference to an outer region.

24. The field emission electron emitter device according to claim 23 further comprising a focusing electrode electrically coupled to the planar electron emitter.

25. The planar field emission electron emitter device according to claim 23 wherein the planar electron emitter has a generally concave top surface.

26. The planar field emission electron emitter device according to claim 25 wherein the planar electron emitter comprises a metal first layer and a semiconductor second layer deposited on the metal first layer, the semiconductor second layer having a generally concaved top surface.

27. The planar field emission electron emitter device according to claim 23 further comprising a dielectric placed between the emitter electrode and the extracting electrode.

28. The planar field emission electron emitter device according to claim 24 further comprising a second dielectric placed between the extracting electrode and the focusing electrode.

29. The planar field emission electron emitter device according to claim 26 wherein the semiconductor second layer comprises a wide band-gap semiconductor.

30. A process for fabricating planar electron emitters according to claim 8 also comprising the step of, after forming the extracting electrode layer, forming a metal layer on the emitter electrode layer wherein the depositing step places the semiconductor material on the metal layer.